

Langley Research Center

LAPG 7320.1
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Engineering Drawing System

National Aeronautics and Space Administration



**Langley Research Center
DIRECTIVES MANAGEMENT
TRANSMITTAL SHEET**

LAPG 7320.1

March 7, 2003

MATERIAL TRANSMITTED

LAPG 7320.1, "Engineering Drawing System."

RECISION

LAPG 7320.1, dated June 1999.

SUMMARY

This directive has been revised to update a reference. The change is a minor change. Per LMS-CP-2701, "LaRC Directives Initiation, Review, and Approval," a review and approval cycle is not required.

PREFACE

The engineering drawing practices and procedures set forth in this procedural guideline are based on established Government-industry standards, supplemented where necessary by a minimum of requirements peculiar to the NASA Langley Research Center.

The purpose of this procedural guideline is to provide a uniform but flexible system of drawing preparation, use, and interpretation. A standard drawing numbering system, Engineering Drawing Files (EDF), and drawing and documentation control system are included. This procedural guideline will be maintained by the Engineering Drawing System Committee, with representatives from selected organizations.

This LAPG rescinds LAPG 7320.1 dated June 1999.

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ADMINISTRATIVE PROCEDURES

1.1 Scope

The Engineering Drawing System Procedural Guideline establishes the procedures and practices to be followed in the preparation, maintenance, control, and utilization of engineering drawings. It applies to all engineering drawings generated by Langley Research Center (LaRC) personnel and their supporting services contractors. An engineering drawing is defined as a document which discloses, by means of pictorial and/or textual presentations, the form and function of an item, is assigned an LaRC drawing number, and has proper approvals. This procedural guideline is not applicable to any sketches, diagrams, informal schematics, or other instructions.

This procedural guideline is authorized for use in establishing engineering drawing format and procedures for all research, design, development, fabrication, and installation activities.

1.2 Applicable Documents

MIL-STD-100, "Engineering Drawing Practices"

The standards listed below, in addition to those listed in MIL-STD-100, are requirements for generating engineering drawings:

MIL-STD-403, "Preparation for and Installation of Rivets and Screws, Rockets, and Missile Structures"

ANSI B4.1, "Preferred Limits and Fits for Cylindrical Parts"

NAS 523, "Rivet Code"

AWS A1.1, "Metric Practice Guide for the Welding Industry"

AWS A2.4, "Symbols for Welding and Non-Destructive Testing"

Unless identified by date, the edition--including addenda and code cases--in effect at the start of the design, will apply.

1.3 Maintenance of Engineering Drawing Procedural Guidance

The Head, Systems Engineering Competency, has the functional responsibility for the basic procedural guideline and its approval, application, and

implementation. (See Langley Policy Directive 7320.1.) The Engineering Drawing System Committee (EDSC) will have the responsibility for making revisions or adding supplements to the procedural guideline. The committee will consist of the following:

Organization	Number of Representatives
Aerospace Mechanical Systems Division	2
Facility Systems Engineering Division	2
Aerospace Electronic Systems Division	2
Fabrication Division	1
Office of Safety, Environment, and Mission Assurance	1
Facilities Program Development Office	1
Engineering Drawing Files	1
Mechanical Drafting Standards Consultant	1
Architectural Drafting Standards Consultant	1
Electrical Drafting Standards Consultant	1

The Chairperson will be appointed by the Head of the Systems Engineering Competency.

Requests for revisions or supplements to the procedural guideline will be addressed to the committee representative of the originating division. Supplements and revisions will be posted on the NASA Langley Directives Management System web site.

1.4 Engineering Drawing Files

The Engineering Drawing Files (EDF), Facilities Program Development Office, is responsible for assigning drawing numbers, preparing documents for micro-filming, publishing an index, and filing drawings, aperture cards, and X-rays.

1.4.1 Drawing Numbering System

A using organization may request initial assignment of drawing numbers by telephone or letter to EDF. The EDF clerk will enter all available information on the log including the type of drawing, revision letter, title, size, organization code, name of requester, date assigned, and notify the requester of the assigned drawing number(s). A block of numbers may be issued to organizations as required.

1.4.2 Preparation of Drawing Record Card, NASA Langley Form 33

Upon completion of the new or revised drawing, the originator will prepare Langley Form 33, "Drawing Record Card" (available from Stock), by entering data listed below.

TYPE OR USE BALL POINT PEN

See Reverse of Copy 1 for Instructions

DRAWING RECORD CARD

1. Size	2. Drawing No.	3. No. of Sheets	4. Rev. Let.	Doc. Chg. No. 1 2 3	SAMPLE	
6. EDF Roll ID All drawings are microfilmed		7. Organization (Div., Br., Sec.)				
8. Access Control <input type="checkbox"/> CCD <input type="checkbox"/> Proprietary <input type="checkbox"/> Limited <input type="checkbox"/> Other		9. Security Classification <input type="checkbox"/> Unclassified <input type="checkbox"/> Confidential <input type="checkbox"/> Other				
10. Draftsman (Gov. Draftsman or Contractor Name)						
13. Contractor Drawing No.			Sheet No.	Rev. Letter	11. Date	12. Cognizant Engineer
16. Should drawing be retained? If no, complete Item 17 or 18.			<input type="checkbox"/> Yes <input type="checkbox"/> No		19. Remarks	
17. Destroy drawing after Year			18. Review Date Year		▶ Forward Copy 2 With Drawing to EDF	

NASA Langley Form 33 (Rev. Apr. 1999)

Prescribing Document LAPG 7320.1

COPY 1 – Branch Copy – Originator retains

COPY 2 – EDF (Drawing attached)

- (1) **SIZE:** Designated size of drawing, i.e., A, B, C, etc.
- (2) **DRAWING NUMBER:** LaRC number as issued by EDF, or Engineering Branches with a block of numbers assigned.
- (3) **NUMBER OF SHEETS:** Number of last sheet in LaRC drawing number.
- (4) **REVISION LETTER:** Indicate letter or if unrevised, use dash. Circle document change notice number, if applicable.
- (5) **TITLE:** Complete as written in title block. Use uniform description for entire project. Limit abbreviations to those specified in MIL-STD-100.
- (6) **EDF ROLL ID:** To be completed by EDF only.
- (7) **ORGANIZATION (DIVISION-BRANCH):** Abbreviations may be used.
- (8) **ACCESS CONTROL:** Check appropriate blocks, if applicable.
- (9) **SECURITY CLASSIFICATION:** Check appropriate block. Explain if other.
- (10) **DRAFTSMAN:**
 - (a) Government Drawing – Insert initial and last name of NASA draftsman.
 - (b) Drafting Service Contractors are carried as government drawings but the company name is input into this area.
 - (c) Contractor Drawing – Company name will be used, not draftsman.
 - (d) Redrawn Drawing – Maintain same information as shown on original Langley Form 33, "Drawing Record Card."
- (11) **DATE:** Date drawn or date of latest revision.
- (12) **COGNIZANT ENGINEER:** Last name and initial of person responsible for project.

- (13) CONTRACTOR DRAWING NUMBER/SHEET NUMBER/REVISION LETTER: Complete if available.
- (14) BUILDING NUMBER: Fill in this area only if drawing applies to a facility. (Building number should appear in title block.) This is not the location of draftsman or engineer.
- (15) FACILITY NAME: If drawing refers to specific lab or facility name.
- (16) SHOULD DRAWING BE RETAINED? "Yes" indicates permanent retention. "No" indicates drawing may be destroyed by date indicated in Item 17.
- (17) DESTROY DRAWING AFTER: Indicate year.
- (18) REVIEW DATE: Use this block if retention is uncertain at time of input.
- (19) REMARKS: Any additional information such as project number, contract number, or code identification number. Effort code (EC) number for configuration control drawings (CCD's) should be identified in this area. Identify revised sheets of multiple sheet drawings.

NOTE: Langley Form 33 must be prepared using a typewriter or ballpoint pen.

1.4.3 Submittal of Drawings to EDF

After initial release of prints for fabrication, the originator will remove the Section copy (1) of Langley Form 33, attached the EDF copy (2) to the drawing, and forward drawing and Langley Form 33 to EDF.

1.4.4 Verification of Drawings

The EDF clerk will check the drawing for the following:

- a. First submittal – All incoming drawings will be routed through the EDF receiving area for processing. The clerk will check the drawings to determine if they are new drawings being submitted for the first time or if they are drawings being returned to EDF. New and revised drawings are to be processed and made ready for microfilming. For drawings which have not been revised, log in date returned on Langley Form 33, and return to the files.
- b. Valid drawing number – The drawing number will be checked for duplication. EDF will notify and return the drawing to the originating organization if required.
- c. LaRC administrative standards – Drawings must meet LaRC requirements, with the correctly assigned drawing numbers, properly assigned revision letter, and properly identified configurations (see MIL-STD-100). The drawing will be returned to originator if incorrect. When the drawing is verified, the EDF clerk will "FILE" stamped drawing and process for microfilming.

1.4.5 Microfilming

The EDF clerk will prepare the drawing for microfilming. When microfilming is complete, Micrographics will return the drawing and mounted aperture cards to EDF.

1.4.6 Distribution of Aperture Cards

Three silver halide original aperture cards are produced and distributed as follows:

- a. Security File - This file has a copy of all revisions submitted to EDF.
- b. EDF Working File - Latest revision of drawing is maintained in EDF.
- c. Engineering Copy - Organization identified on Langley Form 33 will receive aperture card. If mail stop changes, please notify EDF.

1.4.7 Filing of Drawings and Drawing Record Card

The drawings will be indexed by size and drawing number and placed in files. Information obtained on Langley Form 33 will be indexed into the computer. EDF copy (2) will be filed in a card file in drawing number sequence.

1.4.8. Retrieval of Drawings

The EDF clerk will sign and date EDF copy (2) of Langley Form 33 with name and organization of individual obtaining the original drawing. The card will be filed in drawing number sequence until the drawing is returned.

When the revised drawing is returned to EDF, the same actions are taken by the EDF clerk as for the original drawing. On multisheet drawings, revisions must be indicated on the first sheet and each revised sheet of the drawing or the entire drawing will be rejected by EDF. If original drawing is under configuration control, it cannot be removed from EDF without proper authority.

1.5 Drawing Changes

Changes to the engineering drawings may be made by two methods:

- a. Drawing revision
- b. Document Change Notice (DCN) – Excluding facility drawings. All changes made after formal release of drawings must be authorized in the same manner and processed through EDF for recording and microfilming.

It is in the responsibility of the design activity to assure, that changes and revisions to engineering drawings do not violate configuration control documents (CCD's).

1.5.1 Drawing Revisions

The procedures described in MIL-STD-100 apply in general to LaRC generated drawings. Original drawings or other reproducibles may be withdrawn from EDF for revision and are to be returned to EDF. Revision blocks will be filled out as illustrated in Figure 1.

ZONE	LTR	DESCRIPTION	DATE	APPROVAL
E9	A	MATERIAL WAS QQ-S-633 FOR.-001 PART INCORPORATES DCN NO. 123456	Jan. 5 1965	<i>John Doe</i>
E9	B	(1) WAS 1.12, (2) ADDED 1.85,(3) ADDED TERMINAL TO PT. 9, (4) DELETED C2, (5) RELOCATED POSTS AND TAPPED HOLES	Feb. 3 1966	<i>John Doe</i>
B3		DELINEATION, (6) DELETED NOTE: "TEST IN ACCORDANCE WITH A7812622		

Figure 1. Sample Revision Block

1.5.2 Document Change Notice (DCN)

A DCN is an interim method of changing the information contained on an engineering drawing or associated document. Such changes are to be incorporated into the drawing by formal revision unless otherwise specified on the DCN. DCN's will remain active until incorporated by revision and so noted in the revision block, or for a maximum period of 1 year. The DCN will then be retired to the historical files. Not more than three DCN's may be outstanding against any one drawing at any one time.

1.6 Drawing Cancellation Procedure

Drawing cancellation will be done in accordance with MIL-STD-100.

1.7 Security Classification

DD Form 254, "DOD Contract Security Classification Specification," prepared in accordance with DOD 5220.22M, "Industrial Security Manual

for Safeguarding Classified Information,” will be used by LaRC to provide specific security classification guidance to contractors who originate drawings.

Specific classification and marking guidance will be provided by the LaRC Security Classification Officer on drawings originated by NASA, LaRC. The classification of the drawings will be determined by an appropriate security classification guide or other source document and marked in accordance with ~~NHB-NPG 1620.13C~~, “~~NASA~~ Security ~~Handbook~~ Procedures and Guidelines.”

ENGINEERING DRAWING REQUIREMENTS

2.1 Size and Format

2.1.1 Drawing Sizes

Finished sheet format sizes and the size-designated letter are those listed in MIL-STD-100 (ANSI Y14.1). Multiple-sheet drawings are permissible.

2.1.2 Basic Sheet Format

The general format and arrangement of data on drawings will be in accordance with MIL-STD-100 (ANSI Y14.1). An alternate basic sheet is authorized for use with facility drawings of D size only.

2.1.3 Title Block

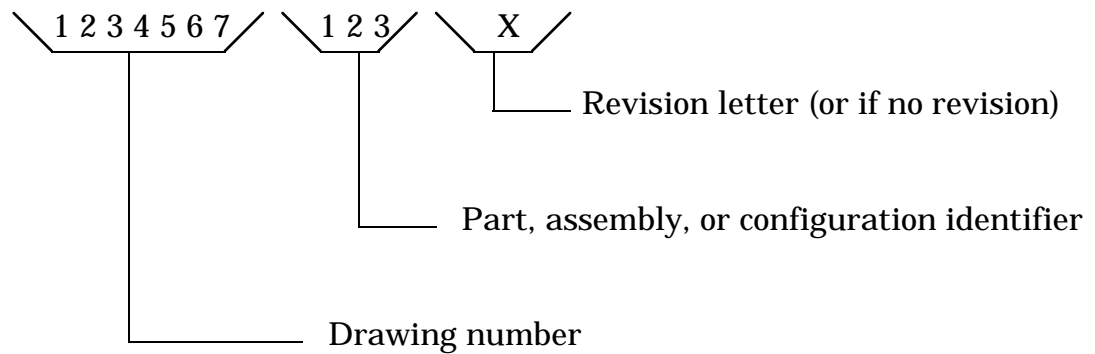
The basic drawing title block in the lower right-hand corner of each drawing will be in accordance with MIL-STD-100 (ANSI Y14.1). An alternate title block is authorized for use with facility drawings of D size only.

2.1.4 Drawing Titles

Drawing titles will conform to the procedures for creating title block nomenclature entries for drawings and for parts detailed thereon as specified in MIL-STD-100 (ANSI Y14.1).

2.1.5 Numbering of Drawings and Parts

The LaRC standard numbering system provides for a seven-digit (maximum) drawing number, centrally controlled and issued by the Engineering Drawing Files, a three-digit (maximum) dash number identifier for parts, subassemblies, assemblies, or configurations of assemblies as determined by the design activity, and a revision letter. The desired method of marking and identification of parts must be specified on the drawing and will conform to LAPG 5300.1, "Space Product Assurance."



2.1.6 Auxiliary Blocks

Auxiliary blocks are authorized as set forth in MIL-STD-100.

2.1.7 Drawing Notes

Drawing notes will be in accordance with MIL-STD-100.

2.2 Basic Requirements

2.2.1 Purpose of Drawings

The purpose of drawings is to convey sufficient engineering requirements, characteristics, and information to manufacture or procure an item or to procure materials or services. Drawings will be complete for the purpose intended. Good drafting technique is essential; however, drawings have no artistic value and drafting technique is not an end in itself. A good drawing is one which can be easily and completely understood by craftsmen, production planners, buyers, and others who must use the drawing.

2.2.2 Legibility

LaRC regulations require the microfilming of all drawings and associated data. Each drawing must be clear enough for legible microfilm copy, as specified in MIL-STD-100. All linework will be sharply defined and of uniform density. Lettering will be clear and adequately spaced. All linework and lettering will be sufficiently opaque to be legible in full size copies prepared by any generally accepted method of reproduction.

2.2.3 Mechanical and Photographic Processes

Mechanical and photographic processes may be fully used to reduce preparation time. Printed material will be typewritten in lieu of hand lettering, whenever possible. When making new drawings which are similar to existing drawings, use photographic or other reproduction techniques to obtain a permanent

reproducible copy of the existing drawings and then revise to produce the new drawings which must be renumbered and released as a new drawing. When a number of drawings or sheets of a drawing are required which are similar in most respects, draw one sheet containing all common data, print permanent reproduces, then add the remaining data to each.

2.2.4 General Drawing Practice

General drawing practice will be in accordance with MIL-STD-100.

2.2.5 Dimensions and Tolerances

MIL-STD-100 (ANSI Y14.5) will be used to establish uniform practices for stating and interpreting requirements shown on drawings.

DRAWING AND DOCUMENTATION CONTROL

3.1 Definition

Drawing and documentation control as used herein as providing assurance that all released drawings reflect the current design status or after fabrication, the as-built status of all hardware.

3.2 Applicability

The procedures outlined in this section will be applied to all drawings and/or electronic files produced at LaRC for the fabrication, construction, and maintenance of component hardware and facilities, except that the existing LaRC Research Facilities Configuration Management Program as defined by LHB 1740.4, "Facility System Safety Analysis and Configuration Management," and the existing subsurface utility drawings program will remain unchanged.

3.3 Drawing Media Types

Three types of drawings are recognized as being produced at LaRC and affected by this procedural guideline. Type 1 is the hand drawn print where only the original exists and all changes are made to that original. Type 2 are electronically generated original drawings where changes are made in the data file and a new original is generated. Type 3 is a totally electronic drawing where a paper original does not exist.

3.4 Release Approval

Only the Branch Head or designee(s) of each organizational unit responsible for the generation of drawings, either in-house or on contract, will be authorized to approve drawings for release. It will be the responsibility of these individuals to assure conformance with the provisions contained within this procedural guideline. The "release approval" of drawings in no way relieves the individual engineer, designer, draftsman, Contracting Officer's Technical Representative (COTR), and so forth who generated the design from the responsibility of assuring the structural integrity and/or mission suitability.

3.5 Approval Process

It will be the responsibility of the LaRC cognizant engineer, designer, draftsman, COTR, and so forth to assure that no drawings are released without proper approvals.

3.5.1 Type 1 Drawings

Upon completion of any drawing, the Branch Head or designee(s) within the cognizant organization will review and sign the original, listing name, date, and organizational code. No construction or fabrication activity will be performed from any engineering drawing not containing proper approval.

Upon revision to an original drawing, the responsible person must sign or initial in the approval space of the revision block. If a DCN is used to make a change, the responsible person must sign in the appropriate approval block and the original approval signatures will be typed in the appropriate spaces. It will be the responsibility of the Branch Head or designee(s) to assure that the drawing is properly marked with a revision notice, and that an updated drawing record card is provided to EDF at the time of approval.

At any time that revisions are extensive enough to require redrawing of an existing part, the original drawing will be marked as being obsolete, superseded by a new drawing. The new drawing will indicate which drawing it supersedes. It will be the responsibility of the Branch Head or designee(s) to assure that both drawings are properly marked before signing the new drawing.

It will be the responsibility of the cognizant engineer, designer, draftsman, COTR, and so forth to assure that all recipient organizations of the original drawings also receive copies of the revision.

As a part of the project records, a log of all drawings and their recipient organization will be maintained. It will be the responsibility of the cognizant engineer, designer, draftsman, COTR, and so forth to assure that this record is up to date and available for notifying organization of revisions to drawings.

3.5.2 Type 2 Drawings

The permanent storage medium for this type of drawing will be the electronically generated and plotted original drawing.

Upon completion of any drawing the Branch Head or designee(s) will review and sign the original, listing name, date, and organizational code. No construction or fabrication activity will be performed from any engineering drawing not containing proper approval.

Upon revision to an original drawing, the responsible person must sign or initial in the approval space of the revision block on the revised original drawing, and the original approval signatures will be typed in the appropriate spaces. The original drawing will be marked obsolete and initialed by the Branch Head or designee(s) prior to approval of the revised original. It will be the responsibility

of the Branch Head or designee(s) to assure that the drawing is properly marked with a revision notice, and that an updated drawing record card is provided to EDF. If a DCN is used to make a change, the original approval signatures will be typed in the appropriate spaces and the responsible person must sign in the appropriate approval block.

It will be the responsibility of the cognizant engineer, designer, draftsman, COTR, and so forth to assure that all recipient organizations of the original drawings also receive copies of the revision.

As a part of the project records, a log of all drawings and their recipient organization will be maintained. It will be the responsibility of the cognizant engineer, designer, draftsman, COTR, and so forth to assure that this record is up to date and available for notifying organization of revisions to drawings.

3.5.3 Type 3 Drawings

The permanent storage medium for this type of drawing will be an electronic storage file. If a paper or Mylar original exists, then it will be treated as a Type 2.

NOTE: THIS SECTION WILL BE COMPLETED AT SUCH TIME THAT APPROPRIATE SOFTWARE AND STORAGE MEDIUM BECOME AVAILABLE AT LARC TO FILE SIGNED COPIES WHICH CAN BE CONTROLLED BY EDF FOR FURTHER USE IN COMPUTER AIDED DESIGN SOFTWARE PROGRAMS.